DEPARTMENT OF THE AIR FORCE TECHNICAL ORDER

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TO 16-40RA63-7

RECTIFIER

RA–63–E

DEPARTMENTS OF THE ARMY AND THE AIR FORCE

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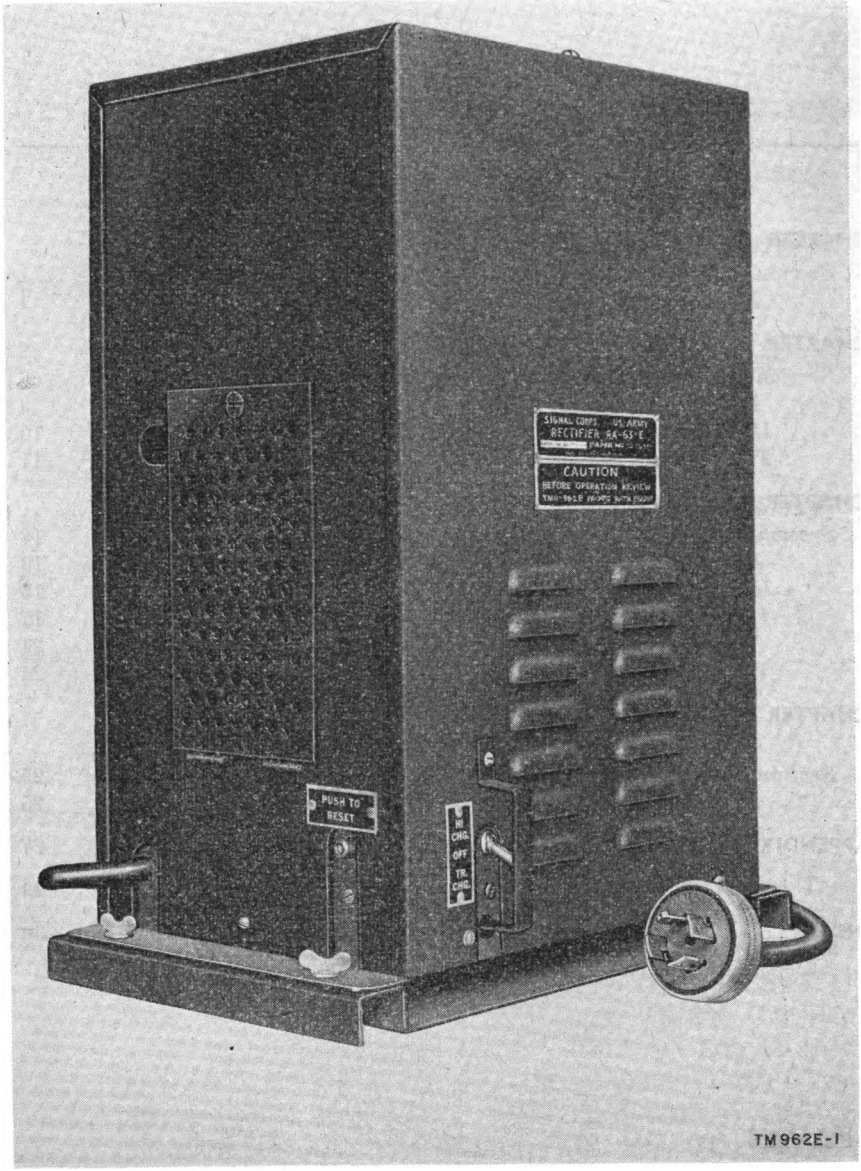

Figure 1. Rectifier RA–63–E.

CHAPTER 1
INTRODUCTION

Section I. GENERAL

1. Scope

a. This manual is published for the information and guidance of the personnel to whom this equipment is issued. It contains information on the operation, organizational and field maintenance of the equipment, a description of the equipment, and a discussion of the theory of operation. This manual applies only to Rectifier RA–63–E.

b. Appendix I contains a list of current references, including supply catalogs, technical manuals, technical bulletins, and other available publications applicable to the equipment. Appendix II contains an identification table of parts.

2. Forms and Records

The following forms will be used for reporting unsatisfactory condition of Army equipment and in performing preventive maintenance:

a. DD Form 6, Report of Damaged or Improper Shipment, will be filled out and forwarded as prescribed in SR 745–45–5 (Army) and AFR 71–4 (Air Force).

b. DA Form 468, Unsatisfactory Equipment Report, will be filled out and forwarded to the Office of the Chief Signal Officer, as prescribed in SR 700–45–5.

c. AF Form 54, Unsatisfactory Report, will be filled out and forwarded to Commanding General, Air Matériel Command, Wright-Patterson Air Force Base, Dayton, Ohio, as prescribed in SR 700–45–5 and AFR 65–26.

d. Use other forms and records as authorized.

Section II. DESCRIPTION AND DATA

3. Description of Rectifier RA–63–E

Rectifier RA–63–E (fig. 1) is a full-wave, selenium-type rectifier

capable of converting 105- to 125-volt ac (alternating current) to 11- to 13-volt dc (direct current). It is equipped with two controls: a HI CHG.—OFF—TR. CHG. switch and a PUSH TO RESET switch. When the HI CHG.—OFF—TR. CHG. switch is in the HI CHG. (high charge) position, the rectifier will deliver 15 to 17.5 amperes. When the switch is in the TR. CHG. (trickle charge) position, the rectifier will deliver 4 to 5 amperes. The PUSH TO RESET switch is an overload circuit breaker for the protection of the equipment. The rectifier consists of a power transformer, a rectifier stack, a circuit breaker, a relay, a toggle switch, a terminal strip, and a cord with a four-prong plug. It is housed in a ventilated sheet metal case and is intended for floor

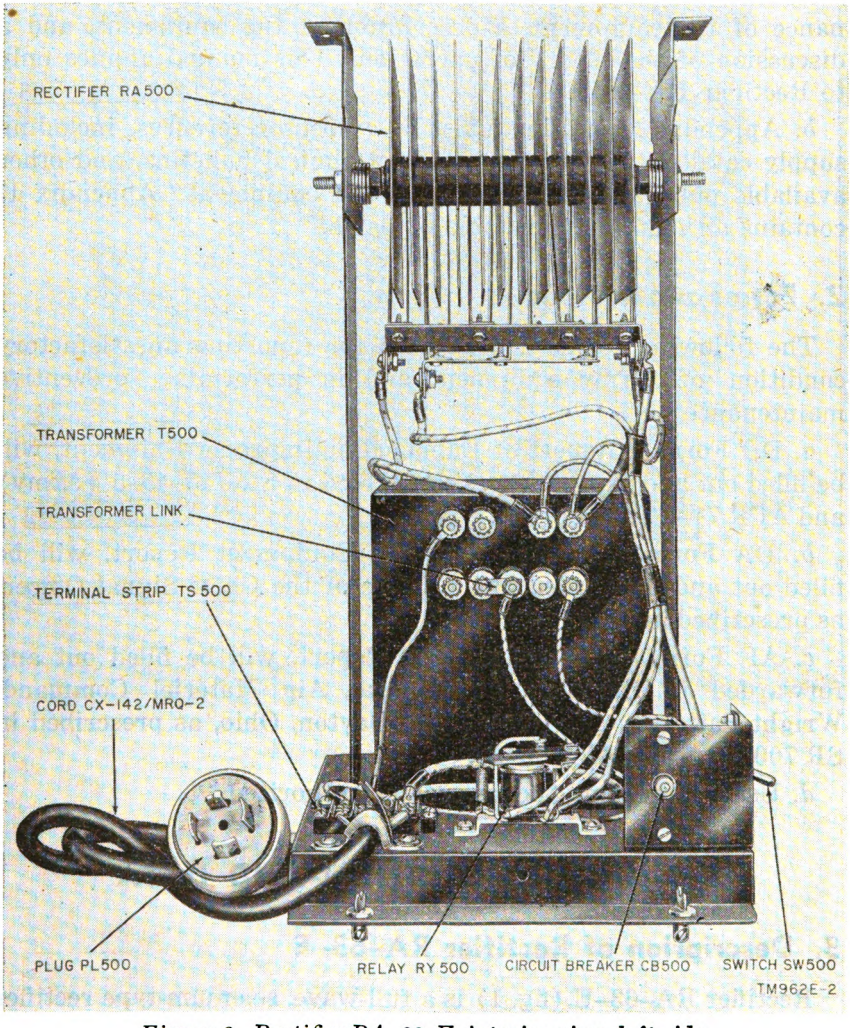

Figure 2. Rectifier RA-63-E, interior view, left side.

or bench mounting. A door on the left-hand side of the case provides easy access to the transformer terminals and also provides storage space for the cord and plug. The complete rectifier is attached to a base plate by four wing-type fasteners, and the base plate is provided with four holes for mounting purposes (figs. 2, 3, and 4).

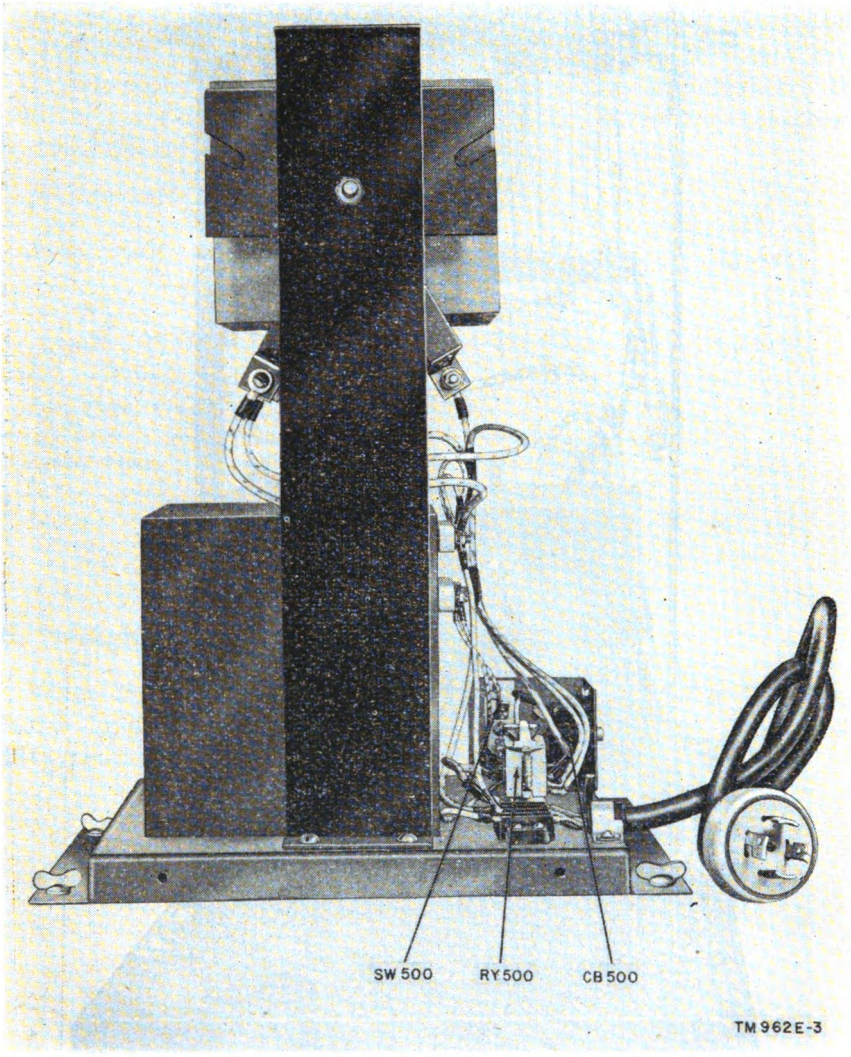

Figure 3. Rectifier RA–63–E, interior view, back.

4. Purpose and Use

Rectifier RA–63–E is designed to rectify a-c power to d-c power for the purpose of charging lead-acid type storage batteries. It is

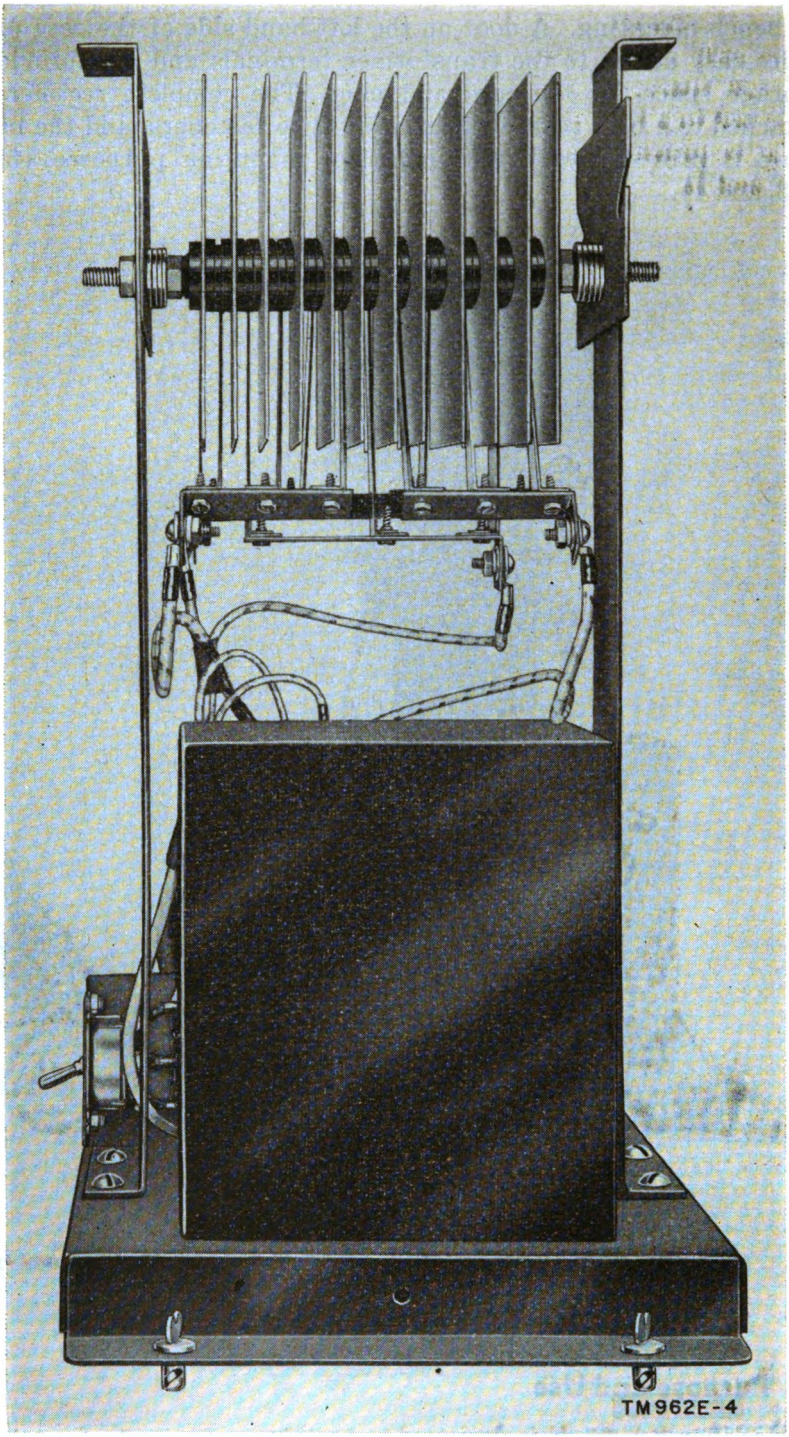

Figure 4. Rectifier RA–63–E, interior view, right side.

intended, primarily, for use with Radio Sets SCR–399–A and SCR–399–B; SCR–499–A, SCR–499–B, and SCR–499–C; AN/MRC–2, AN/MRC–2A, and AN/MRC–2B.

Note. For the application of the rectifier to any of the above radio sets, refer to the technical manual covering the particular system involved.

5. Performance Characteristics

Rectifier RA–63–E is designed to operate on a-c voltages of 105 to 125 volts input. The following table shows the results when 115 volts are applied to the 115-volt tap of the transformer. If 105 volts are applied to the 105-volt tap, or 125 volts are applied to the 125-volt tap, the results will remain the same.

a. Power Input AC.

Applied voltage	Battery condition	Switch position	Amperes
115	Discharged	HI CHG.	2.5 to 3
115	Partial discharge	TR. CHG.	1.5 to 2

b. Power Output DC.

Applied voltage	Battery condition	Switch position	Amperes
115	Discharged	HI CHG.	15 to 17.5
115	Partial discharge	TR. CHG.	4 to 5

6. Weights and Dimensions

When mounted on its base plate, Rectifier RA–63–E is $13\frac{9}{16}$ inches long, $9\frac{15}{16}$ inches wide, and $17\frac{3}{8}$ inches high. It weighs $49\frac{1}{2}$ pounds and displaces 1.36 cubic feet.

CHAPTER 2
OPERATING INSTRUCTIONS

Section I. SERVICE UPON RECEIPT OF EQUIPMENT

7. Siting

a. When Rectifier RA–63–E is shipped as an individual unit, select a cool, dry, well-ventilated location where free circulation of air is assured. Mount the rectifier on a bench or on the floor, using either screws or bolts. Be sure that the door on the left-hand side of the rectifier is accessible for the purpose of making changes of the transformer tap connections when necessary (fig. 5).

b. When Rectifier RA–63–E is shipped as a component part of Radio Set AN/MRC–2( ), it is bolted to the floor of Shelter HO–17–( ).

8. Uncrating, Unpacking, and Checking

a. General. When the rectifier is shipped as a component part of Radio Set AN/MRC–2( ), no uncrating or unpacking is necessary. When it is shipped as an individual unit, select a location convenient to the point of installation where it may be unpacked without exposure to the elements.

Caution: Be careful when uncrating, unpacking, and handling the equipment; it is damaged easily. If it becomes damaged or exposed to the elements, a complete overhaul might be required or the equipment might be rendered useless.

b. Step-by-Step Instructions for Uncrating and Unpacking Export Shipments (fig. 6).

(1) Cut and fold back the steel straps.

(2) Remove the nails with a nail puller. Remove the top and one side of the packing case. Do not attempt to pry off the sides or top; the equipment may be damaged.

(3) Remove the waterproof or moistureproof barrier and any excelsior or corrugated paper covering the equipment inside the packing case.

(4) Remove the equipment from the inner case and place it on a workbench near its final location.

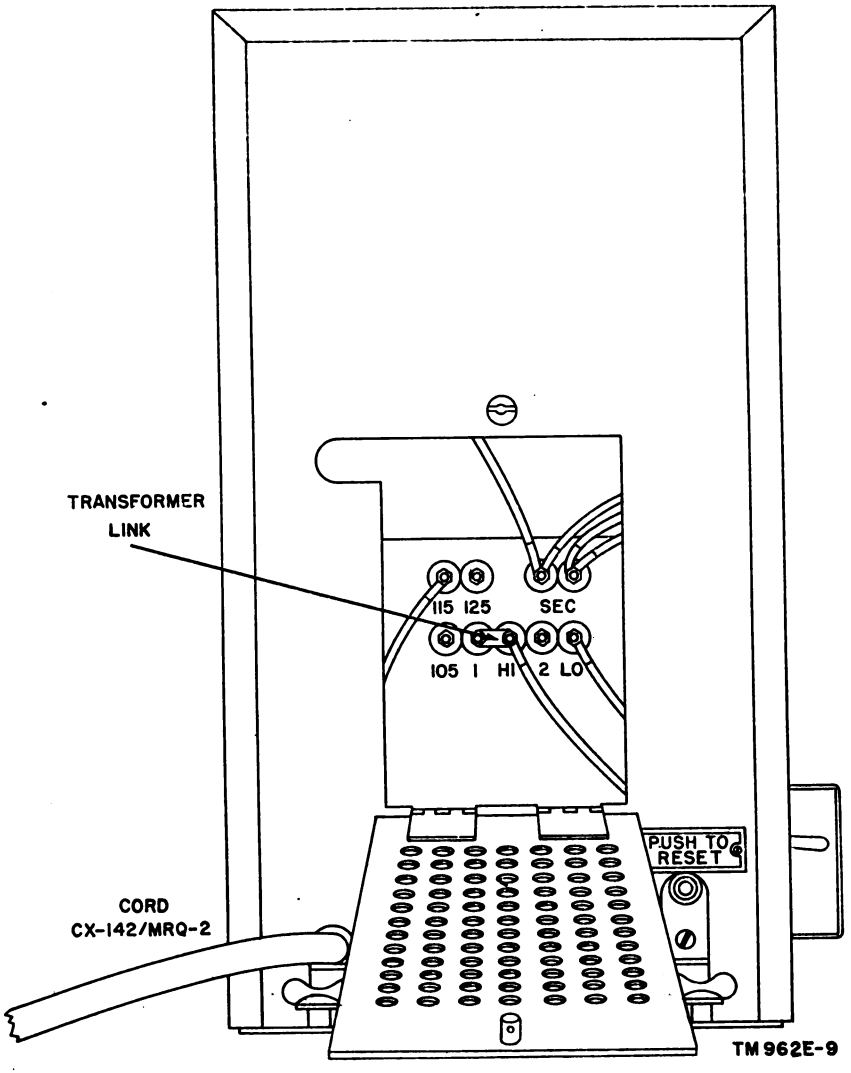

Figure 5. Rectifier RA–63–E, left side, door open.

c. Unpacking Domestic Packing Cases. The rectifier may be shipped in domestic packing cases. When received in this type of case, cut the metal bands and open the cartons that protect the equipment. If heavy wrapping paper has been used, remove it and take out the equipment.

Note. Save the original packing cases and containers for both export and domestic shipments. They can be used again when the equipment is to be stored or shipped.

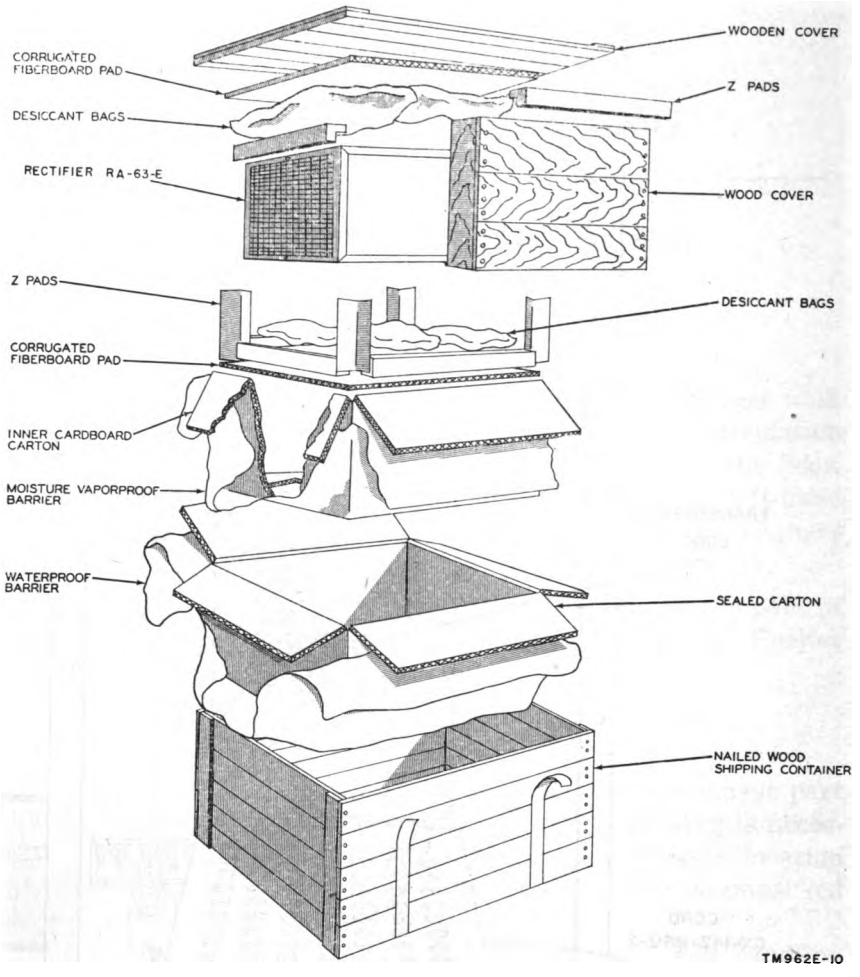

Figure 6. Rectifier RA–63–E, packaging diagram.

d. Checking. Inspect the equipment for possible damage incurred during shipment. If any damage is noted or the equipment does not check with the packing list, fill out and forward DD Form 6. To check for damage to the equipment, take out the six screws along the bottom of the case and remove the cover. The interior is then open to inspection.

9. Setting Up Equipment

Take the rectifier to the previously selected site (par. 7) and mount it on the floor or on a bench. Four holes are drilled in the base plate for mounting purposes. The rectifier may be bolted or

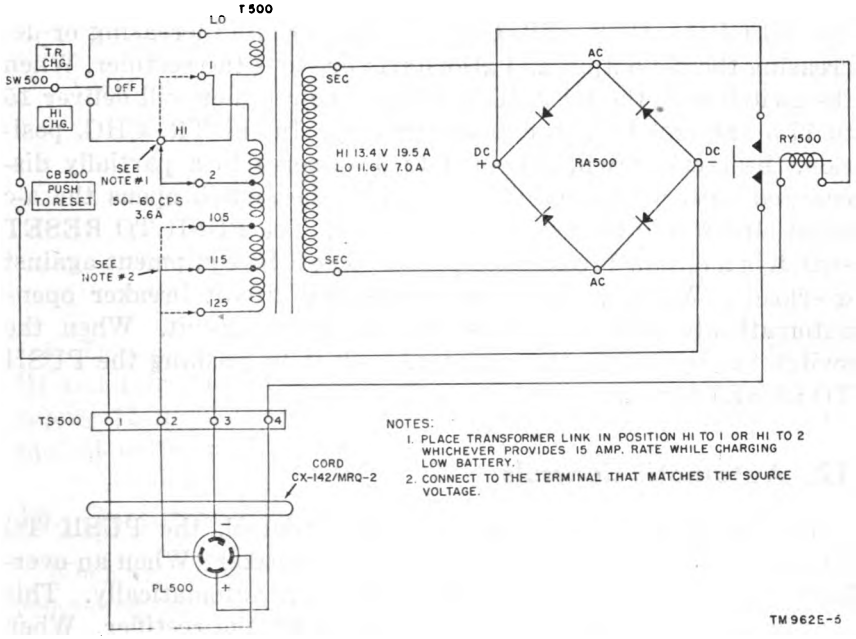

Figure 7. Rectifier RA–63–E, schematic diagram.

fastened with screws; this depends on the permanency of the location.

10. Connections and Interconnections

(figs. 10 and 11)

a. The a-c input and the d-c output connections are accomplished by Cord CX–142/MRQ–2 and plug PL500 when the rectifier is plugged into the equipment with which it is being used.

b. To make the interconnections, verify the input voltage, then connect the wire from terminal No. 2 on terminal strip TS500 to one of the 3 transformer taps on transformer T500. These taps are marked 105, 115, and 125. Match the input voltage and the transformer tap as closely as possible.

Section II. CONTROLS AND INSTRUMENTS

Note. This section describes, locates, illustrates, and furnishes the operating personnel with information pertaining to the various controls and instruments provided for the proper operation of the equipment.

11. Controls

Rectifier RA–63–E contains two controls—a HI CHG.—OFF—TR. CHG. switch located on the front of the rectifier and a PUSH

TO RESET switch located on the left side of the rectifier (fig. 1). The HI CHG.—OFF—TR. CHG. switch permits increasing or decreasing the d-c output and also starts or stops the rectifier. When the switch is in the HI CHG. position, the rectifier will deliver 15 to 17.5 amperes to a discharged battery. In the TR. CHG. position, the rectifier will deliver 4 to 5 amperes to a partially discharged battery. In the OFF position, the switch opens the a-c input circuit and thus stops the rectifier. The PUSH TO RESET switch is a circuit breaker for protection of the equipment against overloads. When an overload occurs, the circuit breaker opens automatically and interrupts the a-c input circuit. When the switch has opened in this manner, reset it by pushing the PUSH TO RESET button.

12. Automatic Controls

The rectifier contains one automatic control, the PUSH TO RESET switch (fig. 1), which is a circuit breaker. When an overload occurs, the circuit breaker will open automatically. This interrupts the a-c input circuit and shuts off the rectifier. When the switch has opened because of an overload, close it by pushing the PUSH TO RESET button. This completes the a-c circuit again, and the rectifier will start charging.

13. Instruments

Rectifier RA–63–E does not contain any instruments. When voltage or amperage readings are desired, the necessary meters must be connected in the circuit as instructed in paragraph 29.

Section III. OPERATION UNDER USUAL CONDITIONS

14. Preliminary Starting Procedure (fig. 7)

After the equipment is installed and ready to operate, the following instructions must be carried out before turning it on.

a. Determine the value of the input voltage. It must be between 105 and 125 volts.

(1) If the input voltage is about 105 volts, connect the wire from the No. 2 terminal on terminal strip TS500 to the terminal marked 105 on transformer T500.

(2) If the input voltage is about 115 volts, connect the wire from the No. 2 terminal to the terminal marked 115 on the transformer.

(3) If the input voltage is about 125 volts, connect the wire from the No. 2 terminal to the terminal marked 125 on the transformer.

Note. The input voltages may not match the markings on the transformer exactly, therefore, match them as closely as possible. For example, if the input voltage is determined as 107 volts, connect the wire from the No. 2 terminal on the terminal strip to the terminal marked 105 on the transformer because that will be the closest match.

b. The transformer link (fig. 5) is connected across terminals HI and 1 or HI and 2. Determine which position of the link will supply 15 to 17.5 amperes to a discharged battery, and connect the link in that position.

15. Operating Procedure

When the preliminary starting procedure (par. 14) has been completed, operate the rectifier according to the following instructions:

a. Determine the condition of the battery to be charged by testing the electrolyte with a hydrometer or by checking the terminal voltage with a d-c voltmeter.

b. Set the HI CHG.—OFF—TR. CHG. switch according to the condition of the battery; HI CHG. for a battery in a discharged condition and TR. CHG. for a partially discharged battery.

c. Press the PUSH TO RESET button and the rectifier will be in operation.

d. To shut the rectifier off, move the HI CHG.—OFF—TR. CHG. switch to the OFF position.

e. If, during the starting procedure, an abnormal result is noted, refer to the trouble-shooting procedures (par. 29). For complete information on approved charging rates and charging methods of batteries, see TM 11–430.

Section IV. OPERATION UNDER UNUSUAL CONDITIONS

16. General

The operation of Rectifier RA–63–E may be difficult in regions where extreme cold, heat, humidity, moisture, and sand conditions

prevail. In paragraphs 17 through 19, instructions are given on procedures for minimizing the effect of these unusual operating conditions.

17. Operation in Arctic Climates

Subzero temperatures and climatic conditions associated with cold weather affect the efficient operation of the equipment. For operation under such adverse conditions, use the following precautions:

a. Handle the equipment carefully.

b. Keep the equipment dry.

c. When equipment which has been exposed to the cold is brought into a warm room, it will start to sweat and will continue to do so until it reaches room temperature. When the equipment has reached room temperature, dry it thoroughly. This condition also arises when equipment warms up during the day after exposure during a cold night.

18. Operation in Tropical Climates

When operated in tropical climates, the equipment may be set up in swamp areas where moisture conditions are more acute than normal. Ventilation is usually very poor, and the high relative humidity causes condensation of moisture on the equipment whenever the temperature of the equipment becomes lower than the ambient air. To minimize this condition, place lighted electric bulbs close to the equipment.

19. Operation in Desert Climates

a. The difficulty which arises with equipment operation in desert areas is the large amount of sand, dust, and dirt which enters the moving parts, such as relays and switches. The ideal precaution is to house the equipment in a dustproof shelter. Since such a building is seldom available and would require air conditioning, the next best precaution is to make the building or shelter in which the equipment is located as dustproof as possible with available materials. Hang wet sacking over the windows, doors, and any other places where sand or dust might enter.

b. Make frequent preventive maintenance checks and keep the equipment as free from dust as possible.

CHAPTER 3
ORGANIZATIONAL MAINTENANCE INSTRUCTIONS

Section I. PRESERVATION

20. Weatherproofing

Signal Corps equipment, when operated under severe climatic conditions, requires special treatment and maintenance. Fungus growth, insects, dust, corrosion, salt spray, excessive moisture, and extreme temperatures are harmful to most materials. A special moistureproofing and fungiproofing treatment has been devised which, if properly applied, provides a reasonable degree of protection. This treatment is explained fully in TB SIG 13 and TB SIG 72.

21. Rustproofing

To prevent rust formation on the equipment, keep all exposed surfaces in good condition. If the finish of the equipment has been damaged, refinish it as instructed in paragraph 33.

Section II. PREVENTIVE MAINTENANCE

22. Definition of Preventive Maintenance

Preventive maintenance is a systematic series of operations performed periodically on equipment to obtain top efficiency in performance, to eliminate breakdowns, and to reduce unwanted interruptions in service. To understand preventive maintenance, it is necessary to distinguish between it and trouble shooting and repair. The primary function of preventive maintenance is to prevent major breakdowns and consequent necessity of repair; in sharp contrast, the primary function of trouble shooting and repair is to locate and correct existing defects. The importance of preventive maintenance cannot be overemphasized. Each component of a complete system must be ready to operate at peak efficiency when needed, and operators and repairmen must main-

tain all equipment at such a standard. The most important preventive maintenance operation is a thorough and systematic inspection at regular intervals. Through these inspections, personnel in charge of the equipment should be able to detect abnormal conditions and forestall major breakdowns.

23. Weekly Maintenance Services

For preventive maintenance purposes, a weekly period consists of 64 operating hours. The following preventive maintenance operations should be performed weekly by organizational personnel, unless the interval is reduced by the local commanding officer:

a. Wipe off the outside of the equipment with a clean cloth; if the dirt is difficult to remove, dampen a cloth with Solvent, dry-cleaning (SD), remove the dirt and then wipe dry.

b. Open the door on the left side of the case (fig. 1) and blow out the dust and dirt with air pressure not exceeding 60 pounds per square inch. If compressed air is not available, a hand bellows or a soft bristle brush may be used.

24. Monthly Maintenance Services

For preventive maintenance purposes, a monthly period consists of 256 operating hours. The following preventive maintenance operations should be performed monthly by organizational maintenance personnel, unless the interval is reduced by the local commanding officer:

a. Remove the six screws that hold the case to the base plate (fig. 1) and remove the case. Visually inspect the rectifier for broken wires, frayed insulation, and loose or cracked soldered connections.

b. Check all nuts, bolts, and screws for tightness. *Be careful when performing this operation, as fittings tightened beyond the pressure for which they are designed will be damaged or broken.*

c. Clean the rectifier disks (fig. 2), by blowing out the dust and dirt that has settled between them, with air pressure. A hand bellows or a soft bristle brush may be used if air pressure is not available.

d. If the contact points of the relay (fig. 2) are dirty and pitted, clean them by filing with an ignition point file.

e. Replace the case and secure it with the six screws.

Section III. THEORY

25. General

Rectifier RA–63–E consists of a simple rectifier circuit which is composed of a transformer, a circuit breaker, a selenium rectifier stack, a relay, and a control switch.

26. Input Voltage
(fig. 7)

a. The input voltage, which may vary from 105 to 125 volts ac, is applied to Rectifier RA–63–E through two of the four conductors contained in Cord CX–142/MRQ–2. These two conductors connect to terminals No. 1 and 2 of terminal board TS500.

(1) One side of the a-c line connects to the primary of transformer T500, through terminal No. 1 of terminal board TS500, the circuit breaker CB500, and switch SW500. Circuit breaker CB500 protects the rectifier from damage, which could result from an overload of current, by opening the a-c line when excessive current is drawn. Switch SW500 changes the step-down ratio between the primary and secondary of transformer T500, thereby varying the a-c voltage in the secondary that is rectified.

(2) The other side of the a-c input line passes from terminal No. 2 of terminal board TS500, to one of three terminals on transformer T500 marked 105, 115, or 125. The terminal to which it connects is determined by the input voltage. If 115 volts ac is the applied voltage, connect terminal No. 2 to the terminal marked 115 on transformer T500. If the input voltage is 106 volts ac, it should be connected to the terminal marked 105 on transformer T500 because it is the closest to matching the input voltage.

b. The transformer link (figs. 2 and 5) is used between terminals HI to 1 or HI to 2 of transformer T500. The link is placed in one of the above positions, whichever position supplies 15 amperes or the nearest to it, while charging a discharged battery.

c. Transformer T500 steps down the a-c input voltages between 105 and 125 volts ac, applied to the primary, to a voltage of from 11.6 to 13.4 volts ac in the secondary.

d. The a-c voltage in the secondary of transformer T500 then is impressed across selenium rectifier bridge RA500, where it is

rectified to a voltage from 11 to 13 volts dc. This rectified voltage from rectifier bridge RA500 then is applied to Cord CX–142/MRQ–2 through the contacts of relay RY500 and terminals No. 3 and 4 of terminal board TS500. Relay RY500 is provided to break the circuit in the positive d-c lead to the battery being charged when switch SW500 is in the OFF position or when an interruption of a-c current occurs (fig. 7).

27. Operation of Selenium Rectifier RA500

(fig. 8)

a. Each leg of rectifier bridge RA500 is composed of three selenium rectifiers that are connected in parallel, which accounts for the high-current capacity of the rectifier unit.

b. With the a-c voltage from the secondary of transformer T500 impressed across rectifier bridge RA500, point A will be negative with respect to point B on every other half of the a-c cycle, or every $\frac{1}{120}$ of a second. When this condition exists, as shown by the dotted arrows, the conducting path will be from point A, through leg 1, the battery load, through leg 3, and back to point B.

c. On the other half of the a-c cycle swing (the next $\frac{1}{120}$ of a second), point B will be negative with respect to point A. Under this condition, the conducting path, as shown by the solid arrows, is from point B, through leg 2, the battery load, through leg 4, and back to point A.

d. With the operation in *b* and *c* above having taken place once, one cycle of ac has been rectified to a pulsating dc in $\frac{1}{60}$ of a second. Since this happens 60 times a second, the pulsations across the battery load are reduced to a small ripple. This ripple is smoothed out even more because the battery load has approximately the same effect as a capacitor, which tends to smooth out the ripples.

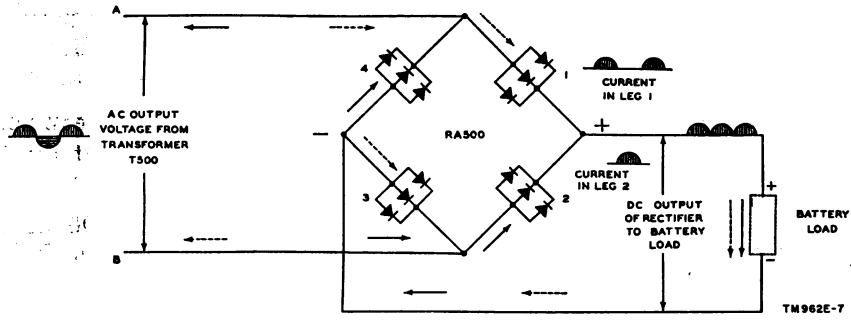

Figure 8. Rectifier RA–63–E, functional schematic diagram of rectifier RA500.

e. The dc through the battery load varies with the condition of the battery. This condition is due to the resistance of the battery being low when it is discharged, and higher as it becomes charged. Tapering off the amount of current drawn from the rectifier results when the battery approaches the fully charged condition.

Section IV. TROUBLE SHOOTING AND REPAIR

28. Meaning of Trouble Shooting

Trouble shooting involves the detection and location of the cause of faulty operation of equipment and the correction of the fault before it develops into a breakdown which will necessitate major repairs. Trouble shooting consists of sectionalization and then localization of the cause of faulty operation or failure. In sectionalization, the cause is traced through a series of checks to determine the component of the equipment or system in which the cause of trouble is located. The cause then is localized by a further series of checks to determine the specific part that is responsible for the difficulty or failure. All operational difficulties have certain definite symptoms which will serve as clues to the cause of trouble. Operators should learn to identify these clues since they will save valuable time in localizing troubles. After identifying the clue, refer to the trouble-shooting chart (par. 29).

29. Trouble-shooting Procedures

Before making the voltage checks described below, check all terminals, screws, and solder points for poor connections or broken wires. If the rectifier fails to operate when switch SW500 is turned to the HI CHG., or TR. CHG. position, check to see if the plug is connected firmly to the receptacle. Push the RESET button. Examine the Cord CX–142/MRQ–2 for broken or shorted conductors and for loose connections to plug PL500. If the cord and plug seem to be in good condition, check according to the following instructions:

a. Voltmeter Checks.

(1) Set an a-c voltmeter on a range greater than 125 volts; then check the a-c voltage at the receptacle. If the voltage is normal, plug the cord into the input receptacle again. The fault is in the rectifier.

(2) With an a-c voltmeter set to the 150-volt range and plug PL500 plugged into the receptacle, make the following checks:

Meter check points	Indication	Fault
A-c input to bridge	No voltage.	Open secondary winding. Open primary winding. Defective switch SW500. Poor connection of transformer link. Defective circuit breaker CB500. Defective cord. Defective plug PL500.
Between LO and 105, 115, or 125, whichever one is used (with SW500 in TR. CHG. position).	No voltage.	Defective switch SW500. Defective circuit breaker CB500. Defective Cord CX–142/MRQ–2. Defective plug PL500.
Between terminals No. 1 and 2 on TS500.	No voltage.	Defective Cord CX–142/MRQ–2. Defective plug PL500.

(3) With a d-c voltmeter set to a range of at least 20 volts and plug PL500 plugged into the receptacle, make the following checks if the proper voltage readings were obtained across the secondary of transformer T500:

Meter check points	Indication	Fault
Between DC— and DC+.	No voltage.	Defective rectifier RA500.
Between terminals No. 3 and 4 of TS500.	No voltage.	Defective rectifier RA500. Defective relay RY500.

b. Ohmmeter Checks. Disconnect the rectifier from the input receptacle.

(1) *Cord CX–142/MRQ–2.*

Check points	Indication	Fault
Terminal No. 1 of TS500 to proper blade of PL500.	No reading.	Broken conductor in Cord CX–142/MRQ–2. Loose or no connection to terminal screw of PL500.
Terminal No. 2 of TS500 to proper blade of PL500.	do.	do.
Terminal No. 3 of TS500 to proper blade of PL500.	do.	do.
Terminal No. 4 of TS500 to proper blade of PL500.	do.	do.

(2) *Circuit Breaker CB500.*

Check points	Indication	Fault
Between the two terminals of the circuit breaker (with SW500 in the OFF position).	No reading.	Circuit breaker defective. Reset mechanism defective.

(3) *Switch SW500.*

Check points	Indication	Fault
Common terminal to TR. CHG. terminal (SW500 in TR. CHG. position).	No reading.	Switch SW500 defective (dirty or broken contacts).
Common terminal to HI CHG. (SW500 in HI CHG. position).	do.	do.

(4) *Transformer T500.*

Check points	Indication	Fault
Between LO terminal and 125 (SW500 can be in any one of three positions).	No reading.	Primary winding open. Transformer link loose or corroded.
Between the two secondary terminals (one lead to rectifier open).	do.	Secondary winding open.

(5) *Relay RY500.*

Check points	Indication	Fault
Between the two terminals of the relay (with one lead disconnected).	No reading.	Coil of relay RY500 open.
Between DC+ and terminal No. 4 of TS500. Press the top of the relay down to close the contacts.	do.	Contacts of RY500 dirty, pitted or corroded. Contacts broken.

(6) *Rectifier RA500.* Disconnect the leads between the arms of the rectifier. Place the ohmmeter test prods across each section, measuring both ways. If the resistance is very low both ways, the rectifier stack is shorted (fig. 9).

c. Normal Resistance Readings. The following readings will be helpful when servicing Rectifier RA-63-F. All measurements

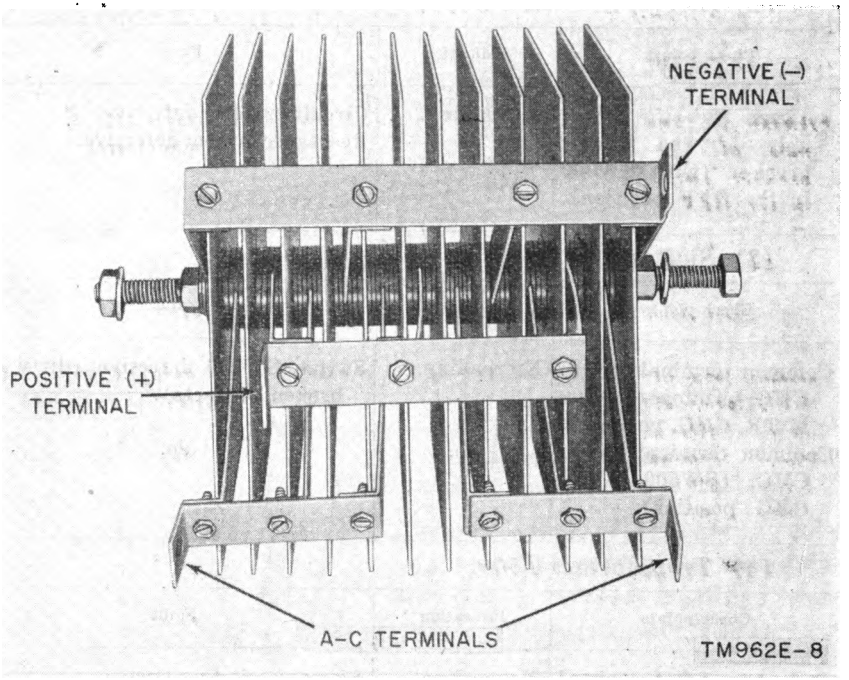

Figure 9. Selenium Rectifier RA500, showing terminals.

were made with the particular component part disconnected from its associated circuit.

(1) *Transformer T500.*

Check points	Resistance (ohms)
125 to 115	.2
115 to 105	.5
105 to 2	.5
2 to 1	.1
HI to LO	.1
SEC to SEC	.2

(2) *Relay RY500.* The resistance measured across the terminals of the coil should be 6 ohms.

(3) *Rectifier RA500.* The resistance measurements across the rectifier arms are considerably different when the test prods are reversed. The resistance of each arm will vary from 2 to 3 ohms in one direction and from 260 to 280 ohms in the other. Across the entire rectifier (a-c terminals), the readings will be approximately 250 ohms in one direction and 170 ohms in the other.

d. Normal Voltage Readings.

(1) The following voltage readings were made with a 1,000 ohm-per-volt voltmeter for d-c voltages and 1,000 ohm-per-volt voltmeter for a-c voltages.

(2) The following table gives the voltage readings under the conditions indicated. The lead from terminal board No. 2 of TS500 is connected to the terminal marked 115 of transformer T500.

Note. The input voltage is 115 volts ac and switch SW500 is in the HI CHG. position.

Measurements taken at	Voltage
Terminals No. 1 and 2 of terminal board TS500 (a-c meter).	115 v ac
Terminals 115 and HI on transformer T500 (a-c meter).	115 v ac
Terminals 125 and HI on transformer T500.	125 v ac
Terminals 105 and HI on transformer T500.	105 v ac
Terminals LO and HI on transformer T500.	5 v ac
The SEC terminals (a-c meter).	13.4 v ac
The a-c terminals of rectifier RA500 (a-c meter).	13.4 v ac
The DC— and DC+ terminals of rectifier RA500 (d-c meter).	14 v dc
Terminals No. 3 and 4 of terminal board TS500 (d-c meter).	14 v ac

30. Replacement of Parts

a. All of the parts in Rectifier RA–63–E are readily accessible and are easily replaced if found to be faulty. If any of the parts need to be replaced, mark the wires with tags or other devices to avoid misconnection when the new part is installed (figs. 10 and 11).

b. A part, such as selenium rectifier RA500, should be marked at its terminals, when it is removed, to eliminate any error when replacing a new part (fig. 9).

Section V. FINAL TESTING

31. General

a. This section is intended as a guide in determining the quality of a repaired Rectifier RA–63–E. The minimum test requirements outlined in the chart below may be performed by maintenance personnel with adequate test equipment and the necessary skills. Repaired equipment meeting these requirements will furnish uniformly satisfactory operation.

b. To make the necessary tests, connect the equipment as follows:

(1) Connect a wattmeter into the a-c input line.

(2) Connect an a-c voltmeter across terminals No. 1 and 2 of terminal board TS500.

(3) Connect a d-c ammeter, with a resistor in series with one of the leads, between terminals No. 3 and 4 of terminal board TS500.

32. Test Equipment Required for Final Testing

The instruments needed for testing and repairing the equipment are as follows:

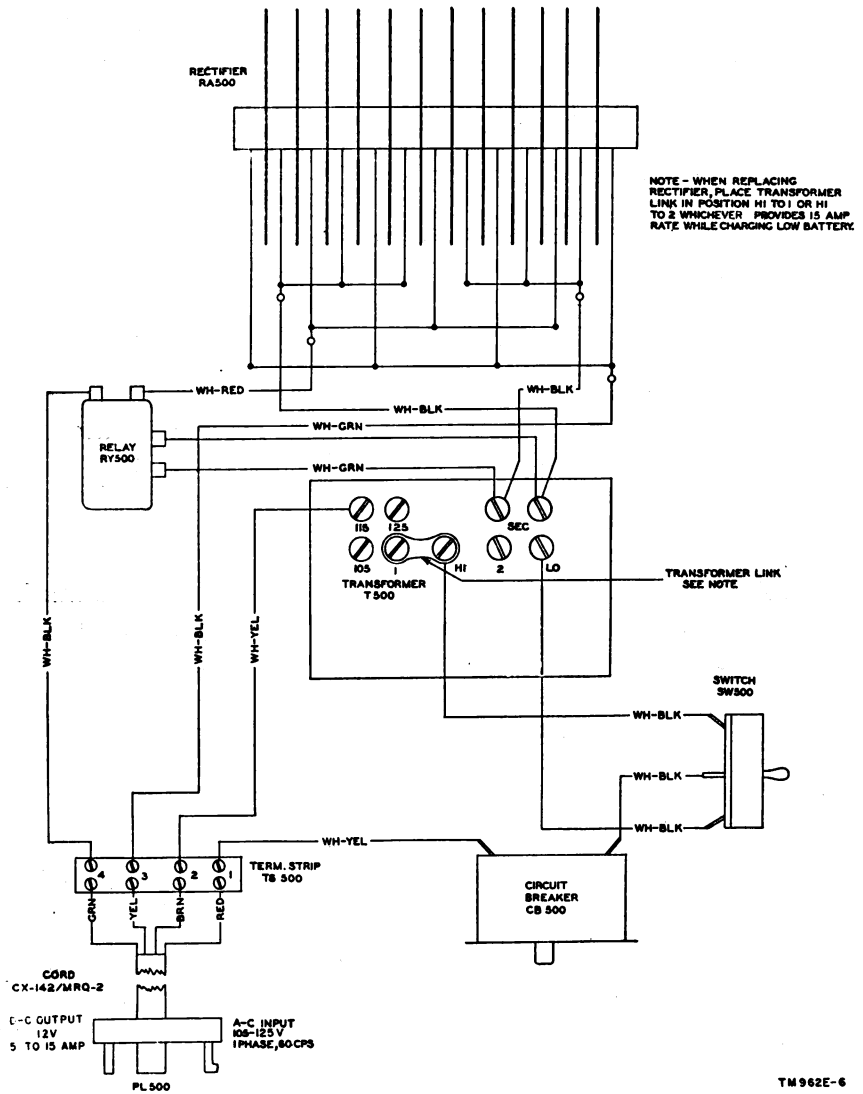

Figure 10. Rectifier RA–63–E, practical wiring diagram (Hallicrafter).

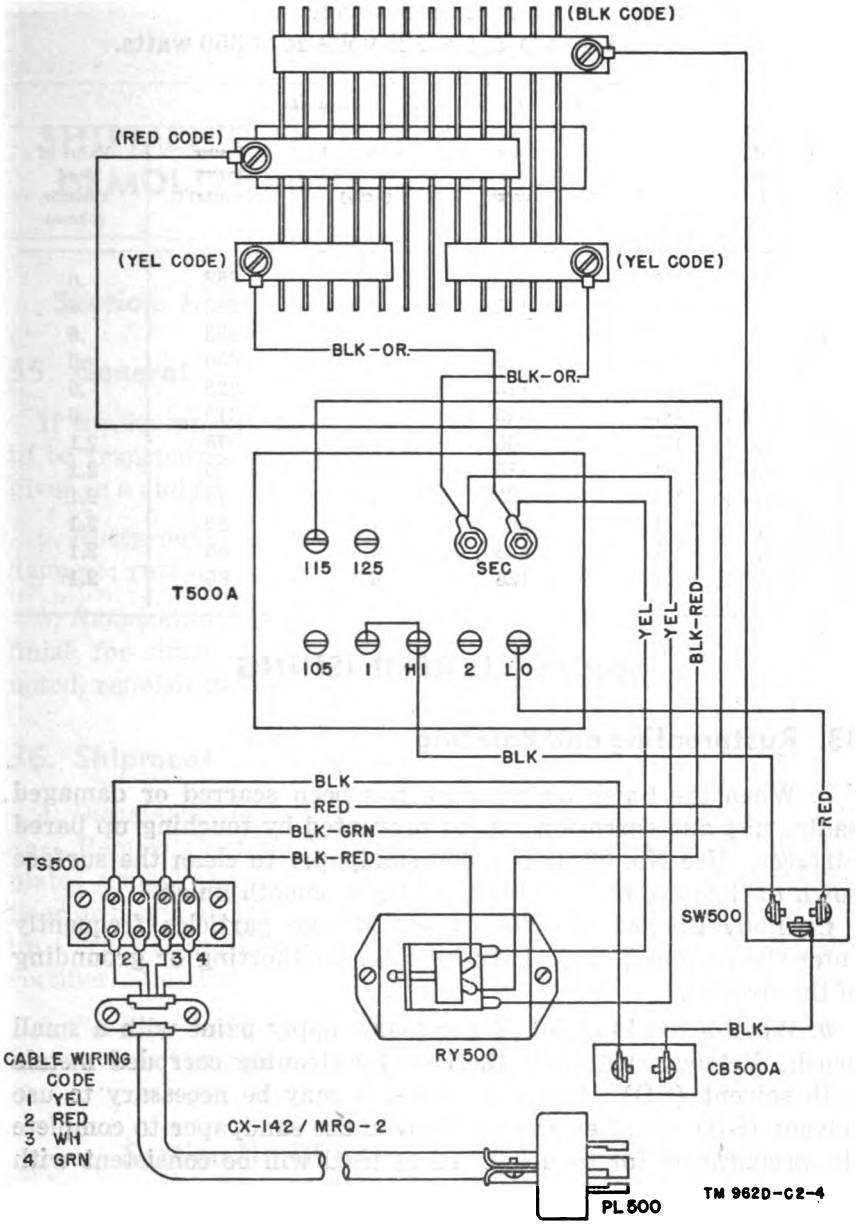

Figure 11. Rectifier RA–63–E, practical wiring diagram (Barker and Williamson).

a. A 1,000 ohm-per-volt a-c voltmeter with a 250-volt scale.

b. A 1,000 ohm-per-volt d-c meter with a 30-volt scale.

c. An ohmmeter for resistance readings.
d. A d-c ammeter with a 25-ampere range.
e. An a-c wattmeter to measure 125 volts ac at 350 watts.

Table of minimum test requirements

Position of TR. CHG.—OFF—HI CHG. switch	Position of transformer link	A-c input (volts)	D-c output current (amp)	Power input (watts)	Value of load resistor (ohms)
HI CHG.	HI–1	105	16.1	282	.6
HI CHG.	HI–1	115	16.1	283	.6
HI CHG.	HI–1	125	16.1	283	.6
HI CHG.	HI–2	105	17.4	330	.6
HI CHG.	HI–2	115	17.5	328	.6
HI CHG.	HI–2	125	17.1	315	.6
TR. CHG.	HI–1	105	4.3	75	2.1
TR. CHG.	HI–1	115	4.4	75	2.1
TR. CHG.	HI–1	125	4.4	75	2.1
TR. CHG.	HI–2	105	4.5	80	2.1
TR. CHG.	HI–2	115	4.6	85	2.1
TR. CHG.	HI–2	125	4.6	85	2.1

Section VI. REFINISHING

33. Rustproofing and Painting

a. When the finish on the case has been scarred or damaged badly, rust and corrosion can be prevented by touching up bared surfaces. Use No. 00 or No. 000 sandpaper to clean the surface down to the bare metal; obtain a bright smooth finish.

Caution: Do not use steel wool. Minute particles frequently enter the case and cause harmful internal shorting or grounding of the circuits.

b. When a touch-up job is necessary, apply paint with a small brush. Remove rust from the case by cleaning corroded metals with solvent (SD). In severe cases, it may be necessary to use solvent (SD) to soften the rust and to use sandpaper to complete the preparation for painting. Paint used will be consistent with existing regulations.

34. Tropicalization

The equipment has been coated with a special moistureproofing and fungiproofing compound. After any repainting has been done, the protective coating also must be repaired. This treatment is explained fully in TB SIG 13 and TB SIG 72.

CHAPTER 4
SHIPMENT AND LIMITED STORAGE AND DEMOLITION TO PREVENT ENEMY USE

Section I. SHIPMENT AND LIMITED STORAGE

35. General

If the equipment is not to be used for an indefinite period or is to be transported a considerable distance, follow the procedures given in *a* and *b* below.

a. Rustproofing. Clean the unit and inspect it for any signs of damage; rustproof the unit as described in paragraph 33.

b. Refinishing. After the unit has been rustproofed, inspect the finish for signs of wear or damage. If any wear or damage is noted, refinish the unit as described in paragraph 33.

36. Shipment

a. Disassembling and Repacking for Shipment or Limited Storage. Remove the four fasteners that hold the rectifier to the base plate; remove the screws or bolts that hold the base plate to the floor or bench and fasten the base plate to the rectifier again. Roll up Cord CX–142/MRQ–2, open the door on the left side of the rectifier, and store the cord inside the rectifier case.

b. Packing and Crating. For instructions on packing and crating, reverse the procedures given in paragraph 8.

Section II. DEMOLITION OF MATÉRIEL TO PREVENT ENEMY USE

37. General

The demolition procedures outlined in paragraphs 38 and 39 will be used to prevent the enemy from using or salvaging this equipment. Demolition of the equipment will be accomplished *only* upon order of the commander.

38. Methods of Demolition

a. Smash. Use sledges, axes, handaxes, pickaxes, hammers, crowbars, heavy tools.

b. Cut. Use axes, handaxes, machetes.

c. Burn. Use gasoline, kerosene, oil, flame throwers, incendiary grenades.

d. Explode. Use firearms, grenades, TNT.

e. Dispose. Bury in slit trenches, fox holes, other holes. Throw into streams. Scatter.

f. Other. Use anything immediately available for destruction of this equipment.

39. Destruction of Components

When ordered by your commander, destroy all equipment to prevent its being used or salvaged by the enemy.

a. Smash (par. 38*a*) rectifiers, switches, transformers, control panels, relays and housing.

b. Cut (par. 38*b*) all wires, cables, and cords.

c. Burn (par. 38*c*) all technical manuals, instruction books, covers, and packing cases.

d. Bury or scatter (par. 38*e*) all remaining parts of the equipment.

e. Destroy everything.

APPENDIX I
REFERENCES

Note. For availability of items listed, check SR 310–20–3, SR 310–20–4, and SR 310–20–5 and Department of the Army Supply Catalog SIG 1 for Signal Corps Supply Catalogs.

1. Army Regulations

AR 380–5	Military Security (Safeguarding Military Information).
AR 750–5	Maintenance of Supplies and Equipment (Maintenance Responsibilities and Shop Operation).

2. Supply Bulletins

SB 11–47	Preparation and Submission of Requisitions for Signal Corps Supplies.
SB 11–100	Serviceability Standards for Signal Equipment in Hands of Troops.

3. Painting, Preserving, and Lubrication

TB SIG 13	Moistureproofing and Fungiproofing Signal Corps Equipment.
TB SIG 69	Lubrication of Ground Signal Equipment.
TM 9–2851	Painting Instructions for Field Use.

4. Camouflage, Decontamination, and Demolition

FM 5–20	Camouflage, Basic Principles.
FM 5–25	Explosives and Demolitions.
TM 3–220	Decontamination.

5. Other Publications

FM 24–5	Signal Communications.
FM 24–18	Field Radio Techniques.
FM 24–20	Field Wire Technique.
SR 310–20–3	Index of Training Publications.

SR 310–20–4	Index of Technical Manuals, Technical Regulations, Technical Bulletins, Supply Bulletins, Lubrication Orders, and Modification Work Orders.
SR 310–20–5	Index of Administrative Publications.
SR 700–45–5	Unsatisfactory Equipment Report (Reports Control Symbol CSGLD–247).
SR 745–45–5 AFR 71–4	Report of Damaged or Improper Shipment (Reports Control Symbols CSGLD–66 (Army) and AF–MC–U2 (Air Force)).
TB SIG 4	Methods for Improving the Effectiveness of Jungle Radio Communication.
TB SIG 25	Preventive Maintenance of Power Cords.
TB SIG 54	Working through Jamming with Frequency Modulated Radio Sets.
TB SIG 66	Winter Maintenance of Signal Equipment.
TB SIG 72	Tropical Maintenance of Ground Signal Equipment.
TB SIG 75	Desert Maintenance of Ground Signal Equipment.
TB SIG 123	Preventive Maintenance Practices for Ground Signal Equipment.
TB SIG 178	Preventive Maintenance Guide for Radio Communication Equipment.
TB SIG 219	Operation of Signal Equipment at Low Temperatures.
TM 9–2857	Storage Batteries Lead-Acid Type.
TM 11–430	Batteries for Signal Communication. Except those pertaining to Aircraft.
TM 11–483	Suppression of Radio Noises.
TM 11–676	Grounding Procedure and Protective Devices.

APPENDIX II IDENTIFICATION TABLE OF PARTS

Note. The following is an identification table of parts for Rectifier RA–63–E (Sig C stock No. 3H4691–63E). The fact that a part is listed in this table is not sufficient basis for requisitioning the item. Requisitions must cite an authorized basis, such as a specific T/O&E, T/A, SIG 7 & 8, SIG 7–8–10, SIG 10, list of allowances of expendable material, or another authorized supply basis. The Department of the Army Supply Catalog applicable to the equipment covered in this manual is SIG 7 & 8–RA–63. For an index of available supply catalogs in the Signal portion of the Department of the Army Supply Catalog, see the latest issue of SIG 1.

Ref Symbol	Name of part and description	Function of part	Signal Corps stock No.
TS500	BOARD, terminal: general purpose; 4 term., double screw type; 2½ in. lg x 1⅛ in. wd x ½ in. d.	Connection point for cord and components of rectifier.	2Z9404.1
	CABLE ASSEMBLY, special purpose: electrical; two #14 AWG std cond; two #10 AWG std cond; 52½ in. lg o/a.	Connects rectifier to using equipment	3E6000–142
CB500	CIRCUIT BREAKER: SPST; 110/220 v ac, 50 to 60 cyc, 4 amp; 30 v dc, 4 amp.	Protects equipment against overload	3H900–4–4
	CLAMP: electrical; ½ in. max-dia	Clamps cable assembly to rectifier	2Z2642.431
PL500	CONNECTOR, plug: 4 cont blades	Plugs into using equipment	6Z3160
	FASTENER, spring-lock: wing type; 1$\frac{1}{32}$ in. lg x 1$\frac{3}{32}$ in. h; rh; $\frac{9}{16}$ in. dia; stud, $\frac{9}{16}$ in. lg, shank, ¼ in. dia; stud, $\frac{9}{32}$ in. dia hole in chassis.	Secures rectifier to base plate	6L31514C–5
RA500	RECTIFIER, metallic: selenium; input 14.4 v ac; output 12 v dc; 15.1 amp max current; full-wave rectification.	Rectifies as to dc	3H4870–162
RY500	RELAY, armature: SPST; normally open; 6.5 ohm resistance winding; ac operating voltage 12 v; 50 to 60 cyc.	Prevents feedback from batteries	2Z7585–136
	STUD: cowl fastener	Is used with Sig–C stock No. 6L31514C–5.	6L31514C–4
SW500	SWITCH, toggle: SPDT; three position; locking action	Turns rectifier off and controls the rate of charge.	3Z9863–45E
T500	TRANSFORMER, power: step-down; input 105 to 125 v ac, 50 to 60 cyc; output 14.6 v ac, 18 amp; hs metal case.	Steps down 125 volts ac to 14.5 volts ac.	2Z9621–208

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